UNIVERSITY OF GONDAR

COLLEGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF MEDICINE DEPARTMENT OF OPTOMETRY

PREVALENCE AND ASSOCIATED FACTORS OF VERNAL KERATOCONJUNCTIVITIS AMONG CHILDREN LIVING IN GONDAR CITY, NORTHWEST ETHIOPIA

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GONDAR, ETHIOPIA

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V. ACRONYMS

LVKC – Limbal Vernal Keratoconjunctivitis

MVKC – Mixed Vernal Keratoconjunctivitis

OPD – Out Patient Department

PVKC – Palpebral Vernal Keratoconjunctivitis

SPSS - Statistical Package for the Social Sciences

SLB – Slit Lamb Biomicroscope

UOG TEH – University of Gondar Tertiary Eye Hospital

UVL – Ultraviolet Light

VKC – Vernal Keratoconjunctivitis

VI. Abstract

Introduction: Vernal keratoconjunctivitis is the common ocular morbidity of children in warm dry climates such as the Mediterranean countries, central and South America, Sub – Saharan Africa and Middle East. It accounts for about 3% of serious ophthalmic cases in tropical countries. It is chronic, recurrent ocular disease and once occurs in the early childhood, it will persist until puberty age. So that children who affected by VKC earlier, will face difficulty of learning, visual and mental stress.

Objective: The main purpose of this study was to assess the prevalence and associated factors of VKC among children living in Gondar city.

Methods: Cross sectional study design was used to study VKC prevalence and associated factors among children living in Gondar city between May 5 and 25, 2015. A total of 744 samples were selected by multistage sampling method. A pretested structured questionnaire, 3x magnifying loop and torch light were used to collect data. The data was entered into EPI INFO 3.5.1, processed and analyzed by using SPSS version 20. Frequencies, proportions, rates and summary statistics were determined for descriptive factors. Bivariate and multivariate logistic regressions were used to determine the associated factors. Variables were considered significant at 95% CI and P-value <0.05.

Results – A total of 737 study population with a response rate of 99.06% and mean age of 8.7(SD±3.9) years were included in the study. The prevalence of VKC was 43(5.8% (95% CI: 4.14, 7.53)) and the most common type was mixed VKC 35(81.4%). The use of electric power for cooking (AOR=0.16 (95% CI: 0.04, 0.62)), child dust exposure (AOR= 10.0 (95% CI: 4.16, 20.0)), child history of non-ocular allergic diseases (AOR= 4.0 (95% CI: 1.92, 8.33)), and family history of non-ocular allergic diseases (AOR= 3.57(95% CI: 1.39, 0.09) were independently significant with VKC.

Conclusion and recommendations: The prevalence of VKC was 43(5.8%) among children living in Gondar city. Focusing in prevention mechanism is recommended to avoid predisposing factors of VKC.

Keywords: *vernal keratoconjunctivitis, children, Gondar city*

1. Introduction

1.1. Statement of the problem

Vernal keratoconjunctivitis (VKC) is a chronic, recurrent and bilateral inflammation of conjunctiva and cornea that tends to occur in children and young adults with a history of seasonal allergy, asthma, or eczema (1). Its main clinical presentations are itching, photophobia, redness, tearing, foreign body sensation, burning and thick mucoid discharge. In a patents with VKC, 95% of cases remit by the late teens although many of the remainder develops atopic keratoconjunctivitis (2).

VKC has a global distribution with a widely varying incidence. It is less common in Northern Europe and North America but relatively common in warm dry climates such as the Mediterranean countries, central and South America, Sub – Saharan Africa and Middle East. It accounts for about 1% of the eye disease in most part of the world and 3% of serious ophthalmic cases in tropical countries (3, 4).

Boys are affected twice as often as girls with a peak incidence between the ages of 11 and 13 years old although 10% of VKC patients are older than 20 years old at the time of onset. A large number of patients with VKC have symptoms that are exacerbated in the spring, possibly due to the increase in the pollen count (5, 6).

The potential risk factors for VKC are, an individual with a family history of allergies (like when parents are allergic to environmental allergens), the presence of other allergy-related diseases or disorders (like allergic rhinitis, asthma, eczema), warm dry, warm wet regions; spring-summer months and environmental or occupational exposure to seasonal allergy (7).

VKC is the chronic nature of the disease that is potentially devastating to its sufferers. Without aggressive, long-term therapy, the disease can lead to corneal ulcers, keratoconus and permanent visual impairment (8). If a

child with VKC is left untreated, severe visual impairment and blindness from Keratoconus, treatment complications like steroid- induced Cataract and Glaucoma, central corneal scar and prolonged discomfort, mental and emotional stress will be resulted (9).

Vernal Keratoconjunctivitis is a spontaneous body (eye) response to the presence of an allergen; difficult to prevent, but can be managed. Being aware of the allergy activating factor(s) is very important to avoid locations or situations, which provoke the body immune system to respond. Regular maintaining of hygiene and washing hands, staying out of the sun, keeping away from dust and smoke, avoiding touching or rubbing of the eyes are the main prevention mechanism of VKC. Regular medical screening at periodic intervals with physical examinations is also important in controlling the disease (10).

Although VKC is a common public eye problem in Ethiopia, except a few population and hospital based studies, there is no published report on VKC particularly in Gondar city (11-13). Therefore, this study aimed to determine the actual burden of VKC and its associated and exacerbating factors on children so that avoidance of risk factors, regular screening programs for prevention and early intervention of VKC will be planned.

1.2. Literature review

1.2.1. Magnitude of VKC and its clinical pictures

There are a plenty of literatures on magnitude and associated factors of VKC. A lot of researches were conducted at hospital, within community children and school children especially in tropical countries.

The prospective, cross sectional and randomized cross over study done between March 1998 and December 2003 to study clinical pictures and treatment outcome of 48 VKC patients in Thailand, reported that, 28 (58.3%), 16(33.3%) and 4(8.3%) patients had limbal VKC, palpebral VKC and mixed VKC respectively. Among them, symptoms founded were itching, swollen eyelid, tearing, red eye, foreign body sensation, mucous discharge and photophobia. The most common signs were chemosis and fine papillae, Horner's Trantas dot, limbal infiltrates (limbitis), giant papillae, corneal epitheliopathy (mostly in mixed type) (14).

The cross sectional study done in 2013 at Umberto hospital, Italy, in 2013 among 28 VKC patients of age from 4-14 years, indicated that 71% are male and most children were affected by Palpebral form of VKC (71% vs. 29% mixed) while no child was affected by limbal form (15).

A cross sectional study done on clinical profile of 35 VKC patients at tertiary eye care hospital in Aurangabad district of Maharashtra, India in 2013, reported that, the incidence of VKC is tend to occur in the age group of less than 20 years old; which is about 80% while remaining 20% is greater than 20 years old with male predominance (16).

A cross sectional study on ocular infections among school children in a rural Block of Haryana between September 2006 and July 2007, indicated VKC prevalence as 64(5.1%) among total students of 1265 (17). In two thousand thirteen, a cross sectional survey done on prevalence of eye diseases among school children in a rural south-eastern Nigerian community indicated that, VKC was the commonest disorder at 48% of all ocular disorders and 2.9% from total sample of 2092 (18).

From population based cross sectional survey between August and September 2007, among 3,041 school children on prevalence and risk factors of VKC in Rwanda, a total of 121 children were diagnosed with VKC giving a prevalence of 4.0% (95% confidence interval = 3.3% to 4.7%), with severe VKC in 39 of the 121 cases (32.2%). The total study population had an equal distribution by gender, climate, and urban background (19). The hospital based case review of VKC for seven years (1989-1996) in Uganda on clinical pictures of VKC, among 420 VKC patients, the highest incidence occurred between age of 5 and 9 and the lowest was 20 years and above with proportional distribution between both sexes (20).

Similar cross sectional study done in Ethiopia between January 1st and February 28th, 2008, at Butajira town on VKC among school children indicated that, among 792 students, 41(5.2%) have VKC of whom 63.4% were male. The disease was bilateral in all cases and peak age group was in the range of 11-15 years old. Of the three types the predominant VKC was limbal type which was 3% of all (11).

The retrospective chart review done from January 1 to December 31, 2010, among children attending Jimma University tertiary teaching Hospital was found that VKC occurred in 25 cases (7.3%) among study population of 341 patients (12).

The other cross sectional study done between January to February 2006, on patterns of common eye diseases in school children of Goro district, central Ethiopia, reported that, among 826 students of age less than 15 years old, VKC occurred in 13(1.6%) of students (13).

1.2.2. Associated factors of VKC

There are several factors that may make an individual more likely to develop VKC. A retrospective case series study done between1996 to 2004 in Italy indicated that, family history of allergy was noted in 47.05% among total of 406 VKC patients. Non ocular allergy such as rhinitis (30.1%), eczema (16.3), asthma (14.6), and urticaria (4.9) were significantly associated with VKC (21).

From January to December 2006, retrospective chart analysis of 468 patients on demographic and clinical profile of vernal keratoconjunctivitis among patients attending a tertiary eye care center in India, reported that, mean age at presentation was 12 years and personal or family history of allergies was noted in 5% patients (22).

A case control study between July 2002 and June 2004 was done at University college eye clinic in Ibadan, Nigeria, on 56 participants (28 cases and 28 controls) average age of 13.5 years found that, there were strong associated between VKC and cooking with firewood, cooking within living room, and living within 500 meters of transport terminus (23).

Another retrospective hospital based study done between 2000 and 2009 in Nigeria reported that, among 269 VKC patients, refractive error (6.7%) and eye lid disorders (3.3%) were significantly associated with occurrence of VKC (24).

The other study conducted between April and June, 2000 among children(less than 18 years old) attended two hospitals in Ibadan, Nigeria , indicated that, atopic disease such as asthma 7(6%), hay fever 6(5.1%), eczema 5(4.3%), allergic skin rash 1(0.9%), chloroquine reaction 1(0.9%) were found among a total of 171 VKC patients (25).

Nested population based case control study between August and September 2007, on Vernal Keratoconjunctivitis among 3041 School Children: in Rwanda reported that, socioeconomic characteristics, male gender, residence in a hot climate, higher house value and dust exposure are strongly associated with VKC occurrence. Living in urban environment sleeping

on foam mattress as opposed to hay were borderlines of positive significance (26).

1.2.3. Conceptual frame work

The variables associated with VKC were developed from literature, grouped and displayed as follows

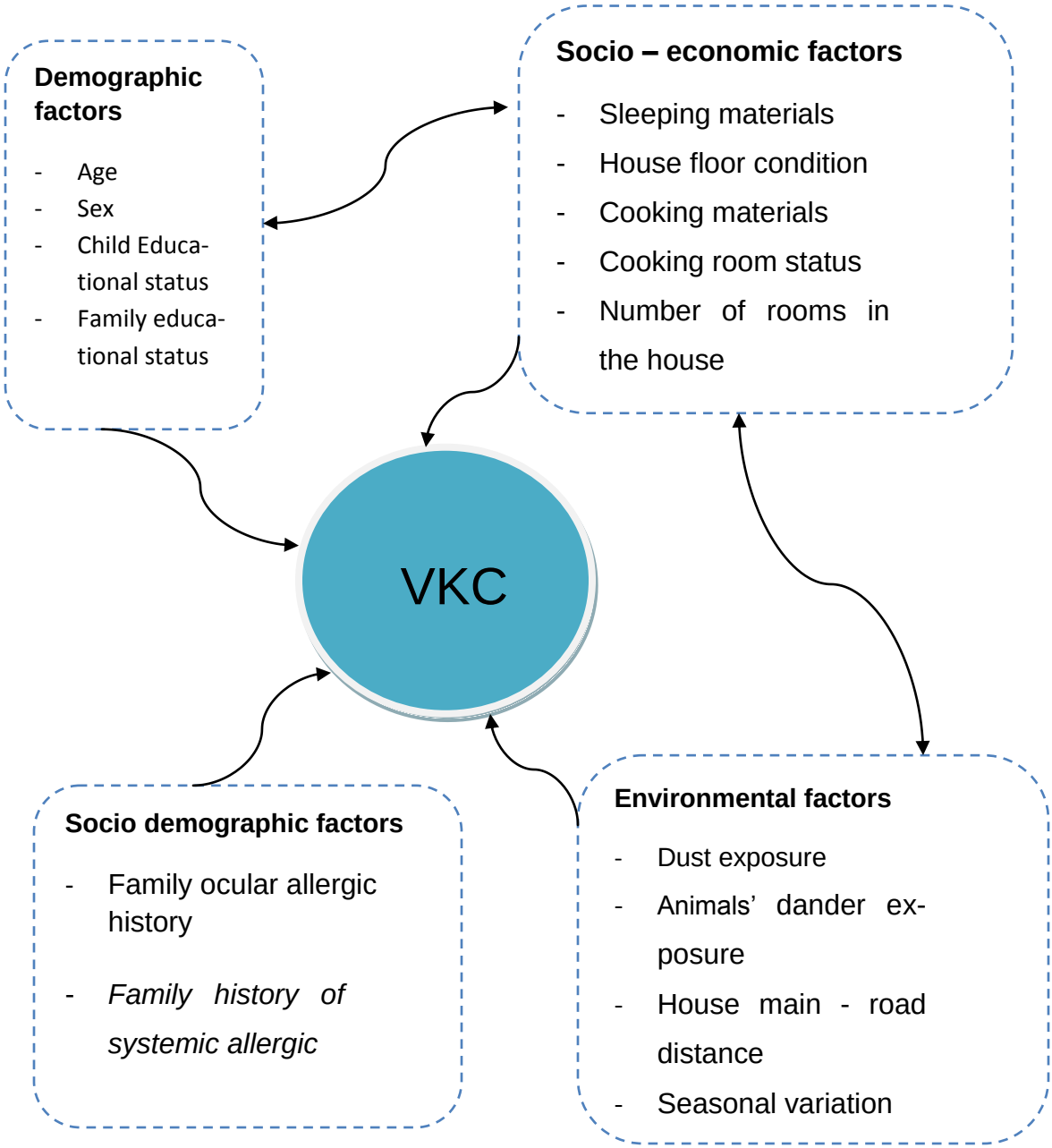

Figure: 1. schematic presentation of conceptual frame work

1.3. Justification

In nature, VKC has a wide geographical variation throughout the world and it is most common cause of childhood hospital attendance in sub Saharan countries and population in warm and dry climate (3, 4). It is bilateral, chronic, recurrent ocular disease and once occurs in the early childhood life it will be persist until puberty age usually up to 20 years of age (2). So that children who affected by VKC early in the morning, will face difficulty of learning, visual and mental stress (5).

In Ethiopia, there were a little hospital based and school based studies regarding VKC which were focused mainly on it is magnitude and clinical presentations (11 - 13). Those studies were done elsewhere in the country not within study area. But no evidence on VKC magnitude and associated factors within community children which include non – school students.

Therefore, due to lack of information on study area and study population regarding magnitude and associated factors, this study was designed to assess prevalence and associated factors of VKC among children living in Gondar city which was contribute additional informations to what is previously known about VKC. As a result, this study will serve as a bench mark for the other researchers and recommend different mechanism to prevent predisposing factors of VKC.

4. Objectives

4.1. General objective

- To assess the prevalence and associated factors of VKC among children living in Gondar city

4.2. Specific objectives

- To determine prevalence of VKC among children in Gondar city
- To describe clinical presentations of VKC among children in Gondar city
- To identify associated factors for VKC among children in Gondar city

5. Methods

5.1. Study design

Community based cross sectional study design was used.

5.2. Study area and period

The study was conducted in Gondar city between May 5 and May 25, 2015. A data obtained from Gondar city administration statistical office indicated that, Gondar city is located in North Gondar zone, 748 km northwest of the capital city, Addis Ababa. It has an altitude of 2,200m above sea level with '*weynadega*' (which has warm and wet weather, and lies below 2,600m above sea level) weather condition, covers an area of 51,565 Km^2 and population of about 207,044. It has 10 sub-cities and 21 kebeles hosting approximately 53, 725 households and 100, 984 children under 19 years of old (27). There is one UOGTEH which provides different specialty eye care services and training of eye care professionals such as Optometrists and Ophthalmologists.

5.3. Source population

- All children between 2 and 18 years of age who live in Gondar city

5.4. Study population

- All children of age between 2 and 8 years old who live in the randomly selected kebeles in Gondar city

5.5. Inclusion and exclusion criteria

5.5.1. Inclusion criteria

- All children of age from 2 to 18 years old who live in Gondar city at least for the last 6 months

5.5.2. Exclusion criteria

- Children with other forms of ocular allergy including seasonal or perennial, atopic keratoconjunctivitis or toxic conjunctivitis

- Children with bacterial or viral conjunctivitis
- children with recent ocular trauma or surgery

5.6. Sampling technique and procedures

Multistage sampling technique using two stage of the sampling process was used. To ensure representativeness, sample was taken from 20% of the administrative area. First, 4 kebeles out of 21 kebeles were selected using simple random sampling method after a census list obtained from Gondar city statistical agency. In four selected kebeles there was total population of 44,438 and total households of 12,861. With the assumption that there was at least one child in each household, systematic random sampling method was used to select participating households proportionally by sampling fraction of 17 to get one child from each house hold. If more than one child were found in the selected house, one child was selected randomly. Diagram of sampling procedures was illustrated as follows.

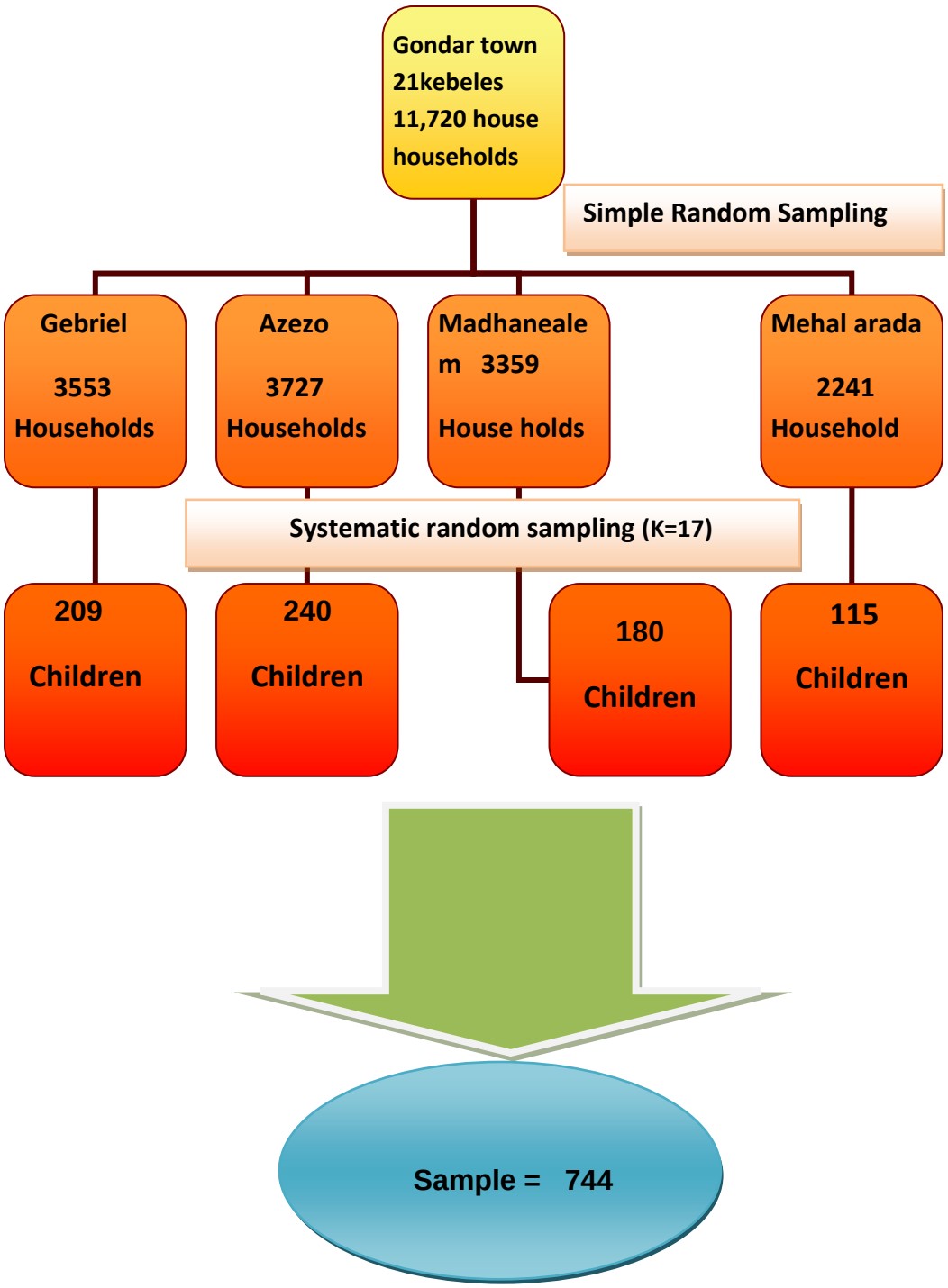

Figure: 2. Schematic presentation of sampling procedure

5.7. Sample size determination

A. Sample size for objective One and two

Sample size was determined by single proportion formula

$$n = \frac{(Z_{\alpha/2})^2 P(1-P)}{d^2}$$

Where; n – sample size

Z – Value of z statistic at 95% confidence interval = 1.96

P – Proportion of VKC 5.2% from similar study in

Butajira school children Ethiopia = 0.052 (11).

1-P – 0.948

d – Maximum allowable error 3% = 0.03

The sample size was 211.

B. Sample size for objective three

By using EPI INFO 3.5.1 computer software and considering 95% CI, 80% power, ratio of control to case 3:1, 42.8% of controls exposed and (OR=2.1) for dust exposure variable (from similar study in Rwanda), (19) the computer generated sample was 338.

Sample size of objective three was selected since it was larger than that of objective one and two. Therefore by considering 2 stages for multistage sampling and 10% non response rate, the final required sample size was 744.

5.8. Variables of the study

5.8.1. Dependent variable

Vernal keratoconjunctivitis- yes/no

5.8.2. Independent variable

A. *demographic variables*

Age

Sex

Child educational status

Household head educational status

B. *Socio economic Variables*

Sleeping materials

House floor condition

Cooking materials

Cooking room status

Number of rooms in the house

C. Environmental variables

Dust exposure

House main - road distance

Seasonal variation

D. Family allergic related variables

Family ocular allergic history

Family non-ocular allergic history

E. *Personal non-ocular allergic history*

5.9. Operational definitions

- Children – from 2 years to 18 years of age and who live in Gondar city at least for the last 6 months.
- *VKC* – defined as presence of papillae $\geq$ 1mm on tarsal conjunctiva and/or limbal papillae with itching sensation and if at least one of the following symptoms was present: photophobia, sticky mucus

discharge, redness, tearing and foreign body sensation in the last 6 months.

- *Palpebral* Vernal Keratoconjunctivitis (P*VKC)* – defined as presence of papillae ≥ 1mm on tarsal conjunctiva with itching sensation and if at least one of the following symptoms was present: photophobia, sticky mucus discharge, redness, tearing and foreign body sensation in the last 6 months.
- *Limbal* Vernal Keratoconjunctivitis *(LVKC)* – defines if at least one of limbal finding was present: thickening, broadening, opacifications, Horner- Trantas dots with itching sensation and if at least one of the following symptoms was present: photophobia, sticky mucus discharge, redness, tearing and foreign body sensation in the last 6 months.
- *Mixed* Vernal Keratoconjunctivitis (*MVKC)* – if there were both palpebral and limbal characteristics of VKC was present
- *Dust exposure* – at least history of one episode of exposing to the dust into the either eye that resulted in ocular irritation in the last 6 months
- *Family ocular allergic history*- any known allergic eye disease in father and/or mother and/or brothers and/or sisters
- *Family non-ocular allergic history*- any known non – ocular allergic disease in father and/or mother and/or brothers and/or sisters

5.10. Data collection instruments and personnel

Pre tested structured English version questionnaire was translated to Amharic version and then back to English to ensure accuracy and consistency by professional. This pre tested structured Amharic version questionnaire for interview, English version of data extraction format and 3x magnifying loop with torchlight for physical examinations were used to collect data. Trained 3 BSc and 3 MSc holder senior optometrists under one supervisor were participated in data collection.

5.11. Data collection procedure

Two data collectors were worked together in the field work. First data collectors were introduced themselves to the randomly selected household head by explaining the purpose of the study. After they get permission, they conducted interviews with children aged 15 years old and above and for those less than 15 years of age, the parents or guardians were contacted for answering the questions. After that, physical examinations were done for all study participants. Finally for all children and their parents or guardians advice about the nature, prognosis, management and prevention methods of VKC were given. Those children who had VKC were referred to UOGTEH to get appropriate examination and management.

5.12. Data quality control

Training for data collectors on diagnosis of VKC by using magnifying loop and torch light, and how and what to interview the study participants was conducted. After training, the principal investigator asked them to diagnose known cases of VKC at UOGEH outpatient department (OPD) and with the agreement level of 90%, individuals who correctly pick up signs and symptoms of VKC were assigned as data collectors. On the field work, data quality was insured through supervision and 5% of the sample was cross-checked by principal investigator. After that the collected data were carefully checked for completeness. The variables were coded and labeled for entrance of raw data into EPI INFO 3.5.1. The correct entrance of data was insured by double checking. After exported to SPSS 20, the data were carefully cleaned, analyzed and recoded back to the original names.

5.13. Data processing and analysis

The raw data was entered into EPI INFO 3.5.1, and exported and analyzed by using SPSS version 20. Analysis was done by the investigator using the same computer package. Frequencies, proportions, rates and summary statistics such as mean and standard deviation were calculated

for most variables. Bivariate and multivariate logistic regressions were used to determine the associated factors. The variables that were found with P<0.2 at univariate logistic regression was entered to multivariate logistic analysis and those variables with 95%CI and p-value < 0.05 were considered statically significant.

5.14. Ethical Consideration

Ethical clearance was obtained from the ethical review committee of School of Medicine University of Gondar, College of Medicine and Health Science. The purpose of the research was explained and official letter from school of medicine submitted to each participating kebeles and then supporting letter was obtained from administrative kebeles and submitted to participating house hold. Written consent was also obtained from parents/guardian in Amharic version and confidentiality was kept by coding personal identity during data collection.

5.15. Dissemination and Utilization of Results

This study is being considered to be submitted to University of Gondar College of medicine and health science, department of optometry and ophthalmology. Presentation at national and international conferences will be considered. Publication in scientific journals and online dissemination of the finding is also being considered.

6. Result

6.1. Socio- demographic characteristics of the study population

A total of 737 study participants were included in the study with 99.06% response rate. Among them, 376(51%) were male. The mean age (SD) of study participants was 8.7 years ± 3.9 (range 2-18 years). More than half 440 (59.7%) of the study participants were primary school students and one third 244 (33.1%) of the house head educational status were secondary school. (Table: 1)

Table: 1. Socio-demographic characteristics of study participants among children living in Gondar city, Northwest Ethiopia, 2015.

Variables	Frequency	Percent
Age category		
2-5	193	26.2
6-10	301	40.8
11-18	243	33.0
Sex		
Male	376	51
Female	361	49
Child education status		
preschool	249	33.8
primary	440	59.7
secondary	48	6.5
House hold education status		
Unable to write and read	94	12.8
Primary school	238	32.3
Secondary school	244	33.1
College/university	161	21.8

6.2. Magnitude and clinical features of vernal keratoconjunctivitis

The prevalence of VKC among the study participant was 43(5.8% CI: 4.14, 7.53)) and all of them complained about intense itching sensation. In more than two third of children 30 (69.8%), the signs and symptoms of VKC were exacerbated during spring season which is dry and hot season of the year. About 39 (90.7%) of children had bilateral papillary reaction/cobblestone on tarsal conjunctiva and none of them developed corneal ulcer. (Table: 2)

Table: 2. Magnitude and clinical features of vernal keratoconjunctivitis of study population among children living in Gondar city, Northwest Ethiopia, 2015.

Variables	Frequency	Percent
VKC (n=737)		
Yes	43	5.8
No	694	94.2
Symptoms(n=43)		
Itching	43	100
Redness	37	86
Photophobia	23	53.5
Tearing	24	55.8
Thick discharge	27	62.8
Foreign body sensation	25	58.1
Exacerbation season for VKC (n=43)		
Summer	6	13.9
Spring	30	69.8
Not specified	7	16.3
Sign (n=43)		
Papillary reaction/cobblestone	39	90.7
Mucoid discharge	23	53.5
Hyperemia	25	58.1
Conjunctiva swelling	11	25.6
Limbal opacifications	26	60.5
Limbal thickening	28	65.1
Limbal widening	30	69.8
Horner trantas dot	12	27.9
Superior corneal pannus	9	20.9
Superior punctuate keratitis	2	4.7
Corneal ulcer	--	--

Mixed type of VKC is most prevalent 35(81.4%) and more males are affected by limbal 4(9.3 %) and mixed 23 (53.49%) sub types of VKC. (Figure: 3)

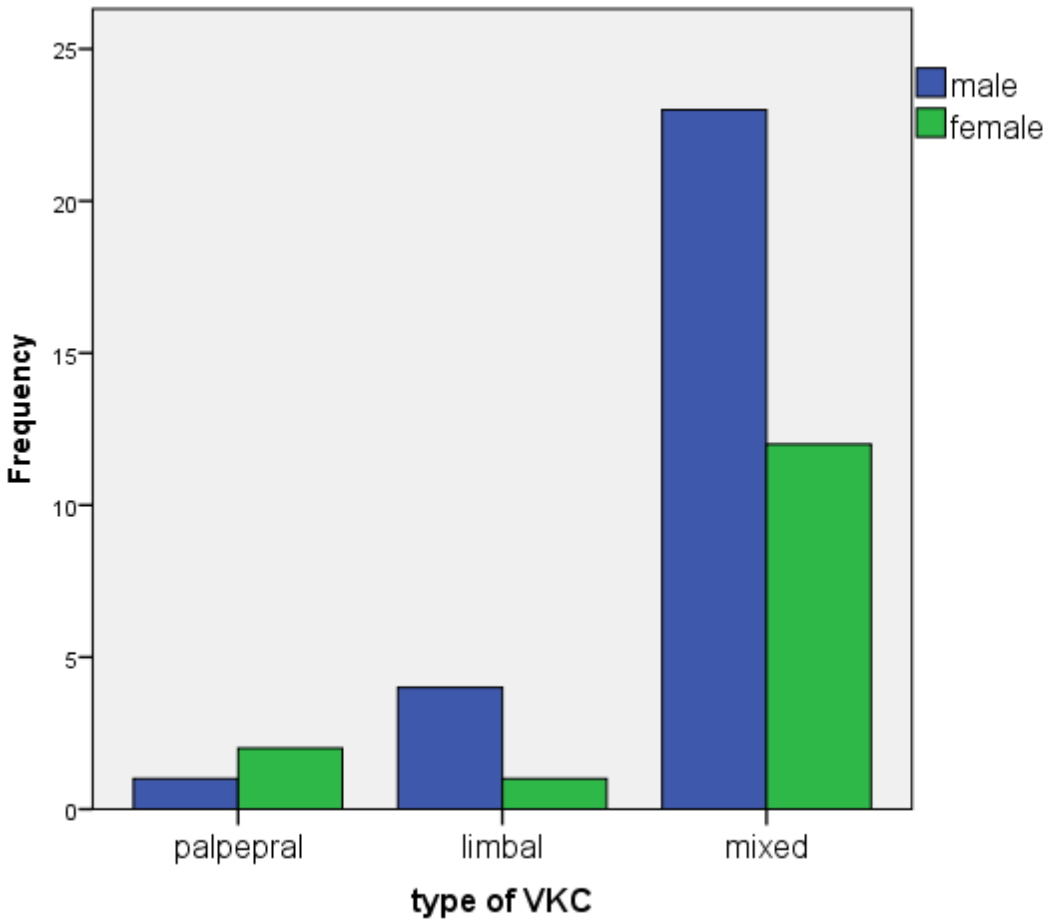

Figure: 3. Types of vernal keratonjunctivitis of study population in terms of sex among children living in Gondar city, Northwest Ethiopia, 2015.

6.3. Factors associated with vernal keratoconjunctivitis

In the bivariate analysis, house floor condition being soil, the use of electric power for cooking, child dust exposure, child history of non-ocular allergic diseases, family history of allergic eye diseases and family history of non-ocular allergic diseases were significantly associated with VKC. Whereas, in the multivariate analysis, the use of electric power for cooking, child dust exposure, child history of non ocular allergic diseases and family history of systemic allergic diseases were found to be independently significant with VKC occurrence.

As a result, those study participants who were using electric power for cooking were 0.16 times less likely to develop VKC as compared to those who were using kerosene/firewood (AOR=0.16 (95% CI: 0.04, 0.62)). Those children who were exposed to the dust were 10 times more likely to develop VKC as compared to non-exposed (AOR= 10.0 (95% CI: 4.16, 20.0)). The children who had non-ocular allergic disease were 4 times more likely to develop VKC as compared to those who had no non-ocular allergic diseases (AOR= 4.0 (95% CI: 1.92, 8.33)). The children with family history of non-ocular allergic diseases were also 3.57 more likely to be develop VKC as compared to those who had no family history of non-ocular allergic diseases (AOR= 3.57(95% CI: 1.39, 9.09). (Table: 3)

Table 3: Factors associated with vernal keratoconjunctivitis of study population among children living in Gondar city, Northwest Ethiopia, 2015.

Variables	VKC			
	Yes	No	COR (95% CI)	AOR (95% CI)
Age category in years				
2-5	8	185	1.00	
6-10	22	279	1.82 (0.79, 4.18)	
11-18	13	230	1.30 (0.53, 3.22)	

Sex				
	Male	28	348	1.86 (0.97, 3.54)
	Female	15	346	1.00
Child educational status				
	Preschool	31	457	1.34 (0.68, 2.67)
	Primary /secondary school	12	237	1.00
House hold educational status				
	Unable to write and read	6	88	1.76 (0.55, 5.63)
	Primary school	16	222	1.86 (0.71, 4.86)
	Secondary school	15	229	1.69 (0.64, 4.46)
	College/university	6	155	1.00
Number of rooms in the house				
	1-2	11	239	1.00
	3 and above	32	455	0.65 (0.32, 1.32)
House floor condition				
	Ceram-ics/cemented	4	272	1.00
	Earth/soil	39	422	6.29 (2.22, 17.79)
Sleeping material				
	Foam	33	525	1.06 (0.51, 2.2)
	Cotton/hay	10	169	1.00
Cooking room condition				
	Separated room	18	330	1.00
	Within living room	10	217	0.84 (0.38, 1.86)
	Open field	15	147	1.87 (0.92, 3.81)

Firewood/kerosene use for cooking				
No	6	110	1.00	
Yes	37	584	1.16 (0.48, 2.82)	
Electric power use for cooking				
No	34	435	1.00	1.00
Yes	9	259	0.44 (0.94, 0.21)	0.16 (0.62, 0.04) *
Distance of house from main road				
Up to 500m	29	361	1.9 (0.99, 3.68)	
500m and above	14	333	1.00	
Dust exposure				
No	8	508	1.00	1.00
Yes	35	186	11.95 (5.44, 26.2)	10.0 (4.16, 20.0)**
Child non-ocular allergic history				
No	26	627	1.00	1.00
Yes	17	67	6.12 (3.16, 11.85)	4 (1.92, 8.33)**
Family ocular allergic history				
No	27	626	1.00	
Yes	16	68	5.45 (2.8, 10.63)	
Family non-ocular allergic history				
No	28	652	1.00	1.00
Yes	15	42	8.32 (4.13, 16.76)	3.57 (1.39, 9.09)**

*P-value * <0.05* *** <0.001*

7. Discussion

Vernal keratoconjunctivitis is one of a serious and leading cause of ophthalmic attendance among the children of the sub Saharan and tropical countries (14, 15). In this study the prevalence of VKC was 43(5.8% CI: 4.14, 7.53)). This finding is inconsistence with other study conducted in rural block of Haryana (5.1%) and Butajira, Ethiopia (5.2%) (11,17). But as compared to the study done in rural south-eastern Nigerian community school children (2.9%) and Rwanda school children (4%), this finding is larger (18, 19). This discrepancy is might be due to difference in study population and because of geographical variations; VKC magnitude is probably varied as a result of differences in predisposing factors found in different geographical area.

The prevalence of types of VKC is different in various parts of the world. In this study, more than three fourth 35(81.4%) of VKC patients had mixed type and more than half 23(53.4%) of them were male. This finding is supported by study done in India (71.85% of mixed subtype of VKC) (22). The other study in Thailand found limbal subtype (58.3%) as most dominant type of VKC (14) where as an Italian study reported the dominancy (71%) of palpebral form of VKC (15). The discrepancy observed here is probably due to the geographical variation and usually as the disease progress the palpebral and limbal type of VKC will become mixed VKC.

In this study, most affected group was 6-10 years of age category 22(51.12%). This finding is in line with study conducted in Uganda which reported the highest incidence of VKC (36%) between 5-9 years of age (20). Children in first decade of life spent much of their time outside the door with playing; and during that, the risk of exposing to ultraviolet light (UVL) and different potential allergens such as dust, wind and pollen count were increase.

In this study, the proportion of male to female ratio was 1.87:1. In other studies conducted in Butajira, Ethiopia (1.4:1) and Uganda (1.7:1) male predominance was also reported (13, 20). Male children are usually

stayed out door and during playing with their friends; probably they are susceptible to exposure of ultraviolet light and different sources of allergens.

Among the common clinical symptoms of VKC, intense itching sensation was the most widely 43(100%) reported among study participants of this study. This finding is in line with study done in Butajira School children (100%) (11). Most of study participants also reported redness 37(86%), photophobia 23(53.5%), tearing 24(55.8%), thick discharge 27 (62.8%), and foreign body sensation 25 (58.1%). This finding is supported by previous study which suggested the presence of conjunctival hyperactivity when UVL, dust, wind and other general climatic factors or non specific stimuli come in contact with conjunctival mucosa (10).

In this study, the commonest clinical feature was papillary reaction/cobblestone 39(90.7%) and least common was eye lid swelling 11(25.6%). Conjunctival hyperemia 25(58.1%), limbal thickening 28(65.1%), widening 30(69.8%), opacifications 26(60.5%), Horner trantas dot 12(27.9%), superior corneal pannus 9(20.9%) and superficial punctuate keratitis 2(4.7%) were also commonly found in this study. This finding is less supported by study done in Thailand that reported most common signs of VKC as chemosis and fine papillae (93%), Horner's Trantas dot (46%), limbal infiltrates (limbitis) (41%), corneal epitheliopathy (22%) ((14). The immunopathogenesis that involves type I and IV hypersensitivity reaction mediated by eosinophils, lymphocytes, plasma cells and monocytes is the mechanism for conjunctival and limbal inflammations in VKC (1).

In this study, more than three fourth 36(83.7%) of VKC children reported seasonal variation of the disease. Among a total of 43 VKC children, 30(69.8%) children encountered exacerbation of VKC in dry and hot spring season and 6(13.9%) of children reported exacerbation of VKC during summer season which is rainy season. This result is supported by

study conducted in Nigeria that reported perennial presentation of VKC with seasonal variation (24). Since spring season is a season of hot, dry and windy climate, the probability of exposing to dust particles, pollen grains and other potential allergens were increased as compared to summer. That is why exacerbation of VKC in spring season was more than summer.

Those study participants who were using electricity power for cooking were 0.16 times less likely to develop VKC as compared to those who used firewood and/or kerosene as cooking fuel (AOR=0.16 (95% CI: 0.62, 0.04)). The other study conducted in Ibadan university college eye clinic, Nigeria, reported that, firewood and/or kerosene fuel was significantly associated with VKC (OR, 2.6; 95% CI, 1.2-5.3; P<0.05) which agreed with the finding of this study (23). This is because electric stoves for cooking might be not the potential sources of allergens unlike that of firewood and kerosene fuel which are the sources of allergen like smoke, hot and dust.

Those children who were exposed to the dust particles were 10 times more likely to be affected by VKC as compared to non-exposed (AOR= 10.0 (95% CI: 4.16, 20.0)). This finding is in agreement with the study conducted in Rwanda school children in whom dust exposure is independently associated with VKC occurrence (OR = 3.9, *P* = 0.024) (18). In most tropical countries, dust particle is much more occurred especially in hot and windy season which contains different potential allergens such as grains from dried grass, pollen from flower of plants and soil particles which might increase the risk of developing VKC. As those allergens come into contact with conjunctival mucosa, hypersensitivity reaction will be induced that resulted in conjunctival inflammation.

The children who had non-ocular allergic disease were 4 times more likely to acquired VKC as compared to the counter parts (AOR= 4.0 (95% CI: 1.92, 8.33)). This result also supports hospital based study conducted in India (5%) and Italy (47.05%) (21,22). Because around 93% of patients with VKC had the same immunopathology with asthma, bronchitis, ecze-

ma and hay fever that involves fixation of IgE molecules on the surface of mast cells and release of mediators, including histamine and prostaglandins. Histamine and prostaglandins mediate type one immune reaction and which lead to VKC (1, 2).

The children with family history of non-ocular allergic diseases were also 3.57 times more likely to be affected by VKC as compared to those who had no family history of non-ocular allergic diseases (AOR= 3.57(95% CI: 1.39, 9.09). This finding is also in line with study conducted in Rwanda (AOR= 4.7 (95% CI: 1.6-14.1) (19). Family history of non-ocular allergic disease like asthma, bronchitis, urticaria and atopic dermatitis probably inherited genetically to the children (1, 2).

8. Limitation of the study

- Some variables are found on limited subjects due to small sample size
- Absence of laboratory investigation for non ocular allergic diseases

9. Conclusion

- The prevalence of VKC among children in Gondar city is 43(5.8%) and the most frequently occurred type is mixed VKC
- Dust exposure, child and family non – ocular allergic eye diseases are positively associated with VKC where as using electric power for cooking was observed as preventive for the occurrence of VKC.

10. Recommendations

- Keeping children away from staying and playing with dusty area recommended for the child guardian to prevent VKC acquisition
- The eye care workers worked at UOGEH is better if they include VKC in their screening programme especially children with history of personal and family history of non – ocular allergic diseases
- Gondar health bureau is also recommended to plan and apply regular VKC screening project in association with UOGEH staffs
- Finally it should be better if researchers will conduct study using prospective cohort study design on VKC and associated factors by including additional variables such as living climate condition, animal dander exposure, family economic status, living environment and by using laboratory investigation for the assessment of variables.

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12. Annexes

Annex 1. Informed consent form in English

Name of the child---------- ID----------

Parent/guardian consent form for interview and eye examination

Dear parent/ guardian

Your child is participating in survey undertaken to detect vernal keratoconjunctivitis and its associated factors. Vernal keratoconjunctivitis has a direct effect on visual status of the child which has complication on the vision that leads to visual discomfort and mental stress. This makes it important to identify burdens and factors associated to keratoconjunctivitis so that your child has a better chance to learn and develop. The result of your child's eye examinations will be collected for research and program planning purposes by University of Gondar, college of Medicine and Health Science Department of Optometry.

With your permission, we would like to:

1. Conduct interview with child
2. Conduct eye examination
3. Collect demographic and vernal keratoconjunctivitis related information from you and your child. If we find that your child has vernal keratoconjunctivitis, we will offer your child free check up through University of Gondar Tertiary Eye Hospital.

You do not have to agree to do these things if you don't want to do**.** You can withdraw your consent at any time. All information that we collect will be confidential and no identifiable information will be released.

I acknowledge that I have understood this consent and the reasons for the study have been explained to me by my own language. I give my consent to my child participating in the study.

Parent/guardian ---------- sign and date ----------

Researcher/witness ---------- sign and date ----------

Annex 2. English version of structured questionnaire

Pre tested structured questioners with data extraction form for prevalence and associated factors of vernal keratoconjunctivitis among children in Gondar city, North West Ethiopia

Introduction

Good morning/afternoon, my name is ---------- I am working for University of Gondar. I am a member of a research group working in GUH. I am studying the prevalence of vernal keratoconjunctivitis and associated factors in children in Gondar city by asking questions and doing physical examination. Your truth full answers for all of our questions are important to know prevalence of vernal keratoconjunctivitis and associated factors. Your answers will be confidential and secret. If you decide that, you do not want to participate in the study now or at any time in the future, you do not want to participate. But we appreciate you if you try to participate and we will go 20 minutes for us to complete the questionnaire and physical examination. Thank you. Next, I will read a consent, which assures your interest to participate.

Do I have your permission to continue?

If yes thank you and continue ----------

If no, thank you and go to next study subject ----------

Data collector

Name ---------- signature ---------- date ----------

Checked by supervisor

Name ---------- signature---------- date----------

S.N	Questions	Responses Category/answers	Remark

1. demographic			
1	ID		
2	Age in years		
3	Sex	1. Male 2. female	
4	Educational status of a child	1. No schooling 2. Kindergarten/KG 3. Primary school 4. Secondary school	
5	Educational status of household head	1. Unable write and read 2. Able to write and read 3. Primary school 4. Secondary school 5. College/university	
Socio - economic characteristics			
6	Sleeping materials	1. Foam mattress 2. Hay mattress 3. Cotton mattress	
7	H ouse floor condition	1. Cemented/clay 2. Earth	
8	Cooking materials	1. Firewood/kerosene 2. Electric energy 3. Both	
9	Cooking room condition	1. Within living room 2. Separated room 3. Open field	
10	Number of rooms in the house	1. 1-2 2. 3 - 4 3. 5 and above	
11	Estimated distance of house from main road	1. Up to 500m 2. 500 -1000m 3. Greater than 1000m	

12	Dust exposure in the last 6 months	1. Yes 2. No	at least one episode of exposing to the dust into the either eye and causing ocular irritation
1. VKC status			
13	Did you experience intense itching sensation within the last 6 months in either eye	1. Yes 2. No	If yes continue the next If no skip to number 19
14	If yes which additional symptoms did you experience from the following list	1. Tearing 5. Thick Discharge 2. Photophobia 3. Tearing 6. Foreign body 4. Redness sensation 7. other	If yes at least three choice, continue to the next It the answer is other skip to Q. 19
15.	Age of onset for itching in year		
16	Seasonal variation	1. Yes 2. No	For the selected symptoms
17	If yes when was become more severe	1. Autumn 2. winter 3. Spring 4. Summer	
18	Any history of treatment for allergic eye disease	1. Yes 2. No	
19	Any associated systemic allergic history	1. Yes 2. No	
20	If yes which from the following list	1. Asthma 2. Bronchitis 3. Atopic Dermatitis 4. Other	

21	Any family ocular allergic history	1. Yes 2. No	
22	Any family systemic allergic history	1. Yes 2. No	
23	If yes which one from the following list	1. Asthma 2. Bronchitis 3. Atopic dermatitis 4. Other	

3. Physical examinations

24	Anterior segment examination	RE		LE		
	1. Tarsal conjunctiva	Yes	No	Yes	No	
	Papillary reaction/cobblestone papillae					
	Mucoid discharge					
	Other					
	Normal					
	2. Bulbar conjunctiva					
	Redness					
	Swelling					
	Other					To be listed
	Normal					
	3. Limbus					
	Opacifications					
	Thickening					
	Widening					
	Horner Trantas dot					
	Other					To be listed
	Normal					
	4. Cornea					
	Superior pannus					
	Superficial keratitis					
	Suspected shield ulcer					

	Other					To be listed
	Normal					
	5. Final assessment					
	VKC					
	Other eye disease					
	Normal					
	6. If VKC, specify the type of VKC					
	Palpebral VKC					
	Bulbar VKC					
	Mixed VKC					

RE- Right eye, LE- Left eye

Annex 3. Amharic version of data extraction format

የጎንደር ዩኒቨርስቲ

ህክምናና ጠና ሳይንስ ኮሌጅ

የሚይን ህክምና ክፍል

መለያ ቁጥር ----------

የቀበሌ ስም----------

<u>የመጠይቅ ና ምርመራ ቅፅ</u>

ጤና ይስጥልኝ ----------እባላለሁ፡፡ የጎንደር ዩኒቨርስቲ ሠተራተኛ ና የዩኒቨርስቲው የጥናት ቡድን አባል ንኝ፡፡ በህጻናት ላይ በብዛት የሚከሰተውን የዐይን አለርጅክ በሽታ መጠንና ተያያዥ ምክንያቶችን በጎንደር ከተማ ውስጥ በሚገኙት ህጻናት መካከል ቃለ መጠይቅ ና ምርመራ በማድረግ እያጠናን እንገኛለን፡፡ ይህ ጥናት እርሶ በሚሰጡን መረጃ ላይ የተመሰረተ ስለሆነ ፍቃድዎ ከሆነ መረጃውን በመስጥትና ልጅዋትን ለዐይን ምርመራ እንዲፈቅዱልን በትህትና እንጠይቃለን፡፡በጥናቱ ላይ መሳተፍ የማይፈልጉ ከሆነ አሁንም ሆነ በሂደት ወስጥ አለመስማማት ይችላሉ፡፡ ሆኖም ግን ጥናቱ ከትንሽ ጊዜ መፍጀት ውጪ ምንም አይነት ጉዳት የማያመጣ ስለ ሆነ እርሶም ሆኑ ልጅዎ እንዲሳተፉ እናበረታተለን፡፡ መረጃዎ ምስጢራዊነቱ የተጠበቀ፣ ለጥናቱ ብቻ የሚውል ና ለሌላ ጉዳይ የማንጠቀምበት መሆኑን ልናረጋግጥልዎ እንወዳለን፡፡ ቃለ መጠይቁና ምረመራው 20 ደቂቃ የሚፈጅ ስለ ሆነ ፍቃደኝነትዎን በፊርማ እንዲገልጡልን ና ዉል እንዲ ወስዱልን በትህትና እየጠየቅን ወደ ቃለ መጠይቁና ምረመራው እንሄዳለን፡፡

ለመሳተፍ ፈቃደኛ ከሆኑ ወደ ሚቀጥለው ገፅ ይለፉ.

ማንኛውም ሊያነሱ የሚፈልጉት ጥያቄ ካለዎት ተመራማሪውን በሚቀጥለው አድራሻ ማነጋገር ይችላሉ፡፡

ስም ፡ ደረጃ ኃይሉ

ስ. ቁ፡ 0910046930

<u>የመረጃ የሰበሰበው</u>

ስም ---------- ፊርማ ---------- ቀን ----------

<u>መረጃውን ያረጋገጠው</u>

ስም---------- ፊርማ ---------- ቀን ----------

ሀ. ማኅበራዊ መረጃ			
ተ.ቁ	ጥያቄ	የመልስ አማራጭ	ምርመራ
1	ዕታ	ሀ. ወንድ ለ. ሴት	
2	ዕድሜ በዓመት		
3	የህጻኑ ትምህርት ደረጃ	ሀ. ትምህርት ያልጀመረ/ች ለ. መዋዕለ ህጻናት ሐ. አንደኛ ደረጃ መ. ሁለተኛ ደረጃ	
4	የቤተሰብ አባወራ የትምህርት ደረጃ	ሀ. ማንበብና መጻፍ የማይችል /የማትችል ለ. ማንበብና መጻፍ የሚችል/የምትችል ሐ. አንደኛ ደረጃ መ. ሁለተኛ ደረጃ ሰ. ኮሌጅ/ዩኒቨርስቲ	
ለ. የአከባቢ ና መኖሪያ ሁኔታ			
5	የህጻኑ መኝታ ፍራሽ ምን ዓይነት ነው	ሀ. ስፖንጅ ለ. ጥጥ ሐ. ገለባ	
6	የመኖሪያ ቤት ወለል ከምን የተሰራ ነው	ሀ. ሽክላ/ሲሚንቶ ለ.አፈር/መሬት	
7	በምንድን ነው የሚያብስሉት	ሀ. በእንጨት/ከሰል/በጋስ ለ. በመብራት ኃይል ሐ. በሁለቱም	
8	ምግብ የማያበስሉበት የት ነው	ሀ. የተለየ ቤት ነው ለ. ከመኖሪ ቤት ወስጥ ሐ. ከውጭ	
9	በመኖሪያ ቤት ውስጥ ስንት ክፍል አለ	ሀ. 1-2 ለ. 3-4 ሐ. 5 ና ከዚያ በላይ	
10	መኖሪያ ቤትዎ ከዋናው መንገድ ምን ያክልይርቃል	ሀ. 500ሜ በታች ለ. ከ500-1000ሜ ሐ. ከ 1000ሜ በላይ	
11	ባለፉት 6 ወራት ህጻኑ ለአዋራ ተጋልጠው ያቃል/ታቃለች	ሀ. አዎ ለ.የለም	አዎ ለማለት ዝቅተኛ አንድ ጊዜ በየትኛውም ዓይን ከተጋለጠ ና የዓይን መቆጥቀጥ ካመጣ

ሐ. የዓይን መቆጣት በሽታን በተመለከተ			
12	ባለፉት 6 ወራት የዓይን ማሳከክ ስሜት ተስምቶ/ሽ ያቃል	ሀ. አዎ ለ.የለም	መልሱ የለም ከሆነ ወደ ጥ. 17 ይለፉ
13	መልሱ አዎ ከሆነ በተጨማሪ ከዚህ በታች ከተዘረዘሩት ስሜቶች የትኛው ተሰምቶህ/ሽ ያቃል	ሀ. የዓይን መቅላት ለ. ፀሃይ የመፍራት ሁኔታ ሐ. ወፈር ያለ ቅምጥ መ. የመቆርቆር ስሜት ሠ. ሌላ ካለ ይጠቀስ	
14	የሚባባስበት ወቅት አለ	ሀ. አዎ ለ. የለም	
15	መልሱ አዎ ከሆነ በየትኛው ወቅት ነው	ሀ. ፀደይ ለ. በጋ ሐ. በልግ መ. ክረምት	መልሱ ከአንድ በላይ ሊሆን ይችላል
16	ስንት ዓመት እያል/ሽ ነው መጀመሪያ የተጠቀሱት ስሜቶች የተከሰተ		
17	ከዚህ በፊት ለዓይን መቆጣት በሽታ ታክመህ/ሽ ያውቃል	ሀ. አዎ ለ. የለም	
18	አጠቃላይ የሰውነት መቆጣት ምልክትአለ	ሀ. አዎ ለ. የለም	(በማያትም ጭምር ይመለሳል)
19	መልሱ አዎ ከሆነ ይጠቀስ	ሀ. አስም ለ. የቆዳ አለርጂ/መቆጣት ሐ. ሌላ	
20	ከቤተሰብ የዓይን መቆጣት በሽታ ያለው ሰው አለ	ሀ. አዎ ለ. የለም	
21	ከቤተሰብ አጠቃላይ የሰውነት መቆጣትምልክት ያለው ሰው አለ	ሀ. አዎ ለ. የለም	
22	መልሱ አዎ ከሆነ ይጠቀስ	ሀ. አስም ለ. የቆዳ አለርጂ/መቆጣት ሐ. ሌላ	

Annex 4. Declaration

I, the undersigned, senior clinical optometry student declare that this thesis report is my original work in partial fulfillment of the requirement for the degree of Master of clinical optometry.

Name: Dereje Hailu

Signature: ----------

Place of submission: University of Gondar, College of Medicine and Health Sciences, School of Medicine, Department of Optometry

Date of Submission: ----------

This thesis report has been submitted for examination with my/our approval as university advisor(s).

Advisors

Name	Signature
Mr. Kbrom Legesse	----------
Dr. Mulusaw Asferaw	----------

Annex 5. Assurance of Investigator

The undersigned agrees to accept responsibility for the scientific, ethical and technical conduct of the research project and for provision of required progress reports as pre terms and conditions of the research and publications office of the University of Gondar.

Name of the student: Dereje Hailu

Date: ---------- Signature: ----------

Approval of the advisor (s)

Advisors

Name	Signature	Date
1. Mr. Kbrom Legesse	----------	----------
2. Dr. Mulusaw Asferaw	----------	----------